

CHAPTER VII.

EXPOSITION OF THE LINNÆAN ARTIFICIAL SYSTEM, SOMEWHAT REFORMED.

THE Classes are 24, distinguished by the number, situation, proportion, or connexion of the Stamens (58).

The Orders, sub-divisions of the Classes (76), are founded on the number of the Pistils (59), or rather of the Styles, or Sessile Stigmas; or on the Fruit (61); or on the nature of the different Florets (68); or on some character of the preceding Classes; or lastly, in the 24th Class, on Natural Families.

The first eleven Classes are known solely by the number of Stamens, in each Perfect Flower (65).

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|----------------|-------------------|------------------------------------|
| 1. MONANDRIA. | Stamen 1. fig. 1. | <i>Globba marantina.</i> |
| 2. DIANDRIA. | Stamens 2. — | 2. <i>Veronica spicata.</i> |
| 3. TRIANDRIA. | ———— 3. — | 3, 4. <i>Poa fluitans.</i> |
| 4. TETRANDRIA. | ———— 4. — | 5, 6, 7. <i>Scabiosa arvensis.</i> |
| 5. PENTANDRIA. | ———— 5. — | 8, 9. <i>Epacris obtusifolia.</i> |
| 6. HEXANDRIA. | ———— 6. — | 10, 11. <i>Gallanthus nivalis.</i> |

7. HEPTANDRIA. Stamens 7. fig. 12. *Aesculus Hippocastanum*.
8. OCTANDRIA. ——— 8. — 13. *Daphne collina*.
9. ENNEANDRIA. ——— 9. — 14. *Buto-mus umbellatus*.
10. DECANDRIA. ——— 10. — 15, 16. *Dianthus cæsius*.
11. DODECANDRIA. Stamens 12 to 15 or 19. fig. 17. *Reseda lutea*.

The two next depend on the situation, or insertion, of the Stamens.

12. ICOSANDRIA. Stamens 20 or more, inserted into the Calyx (53), fig. 18, 19. *Mespilus grandiflora*.
13. POLYANDRIA. Stamens numerous, inserted into the Receptacle (63), fig. 20. *Capparis spinosa*.

The two following depend on the proportion of the Stamens.

14. DIDYNAMIA. Stamens 4, 2 uppermost longest, fig. 21, 22. *Lamium album*.
15. TETRADYNAMIA. Stamens 6, 2 opposite ones shortest, fig. 23, 24. *Thlaspi Bursa-pastoris*, 25-27. *Teesdalia nudicaulis*, 28-31. *Cardamine amara*.

The five following are distinguished by some union of the Stamens to each other, or to the Pistil.

16. MONADELPHIA. Stamens combined by their Filaments (58) into one tube, or common base fig. 31-35. *Geranium sylvaticum*, 36, 37. *Anthæa officinalis*.

17. DIADELPHIA. Stamens combined by their Filaments into two parcels or sets, mostly in unequal numbers; those parcels sometimes combined at their base. fig. 38, 39. *Fumaria solida*. 40. *Spartium scoparium*. 41. *Ulex europæus*. 42-47. *Pisum maritimum*.

18. POLYADELPHIA. Stamens united into more than two parcels, by their Filaments. fig. 48-50. *Hypericum elodes*. 51, 52. *Stuartia pentagyna*. 53-56. *Melaleuca thymifolia*. 223. *Xanthochrysum pictorius*.

19. SYNGENESIA. Stamens united by their Anthers into a tube. The Flowers moreover are compound (68). fig. 57-60. *Picris echinoides*. 61-63. *Carduus nutans*. 64, 65. *Centaurea Cyanus*. 66-69. *Inula dysenterica*.

20. GYNANDRIA. Stamens inserted into the Germen or Style (59). fig. 70-72. *Ophrys apifera*. 73-76. *Stylidium graminifolium*. 77-79. *Androschisma linguiforme*.

The three next are known by a disunion of the Stamens and Pistils, the former being in one Flower, the latter in another, of the same species, such being denominated Separated Flowers (65).

21. MONOECIA. Stamens and Pistils in different Flowers, on the same individual plant. fig. 80-84.

Quercus Robur.

22. DIOECIA. Stamens and Pistils in different Flowers, on two separate plants. fig. 85-87. *Salix herbacea.* 88-91. *Populus alba.*

23. POLYGAMIA. Stamens and Pistils separate in some Flowers, united in others, either on the same plant, or on two or three different ones; such different Flowers being, moreover, dissimilar in their structure in some other respect. fig. 92-95. *Ficus Carica.*

24. CRYPTOGAMIA. Stamens and Pistils either imperfectly, or not at all, known, or not capable of being numbered with any precision. See tab. 7-9.

The *Palmae* originally constituted an appendix to this system, because their Flowers were too little known to admit of arrangement by the Stamens and Pistils. But that difficulty is now almost entirely removed, and the Genera of this tribe are mostly found reducible to the 6th, 21st, or 22d Classes.

The Orders of the first 13 Classes, *Monandria* to *Polyandria* inclusive, are characterized solely by the number of the Styles, or sessile Stigmas, in each Perfect Flower (65). These Orders are more or less numerous in the several Classes, and are distinguished as follows:

MONOGYNIA.	Style, or Sessile Stigma, 1. fig.
	2, 13, 20.
DIGYNIA.	Styles, or Sessile Stigmas, 2. fig. 16
TRIGYNIA.	_____ 3. fig. 19
	48.
TETRAGYNIA.	_____ 4. fig. 133
PENTAGYNIA.	_____ 5. fig. 34
	51.
HEXAGYNIA.	_____ 6. fig. 14
HEPTAGYNIA.	_____ 7. <i>Septa</i>
	<i>capensis.</i> Andr. Repos. t. 90.
OCTAGYNIA.	_____ 8. } scarce
ENNEAGYNIA.	_____ 9. } ever
	occu
DECAGYNIA.	_____ 10. <i>Neu</i>
	<i>rada</i> and <i>Phytolacca</i> .
DODECAGYNIA.	_____ about 12. fig. 242
POLYGYNIA.	_____ numerou
	fig. 229.

These parts are seldom so numerous in any Flower as the Stamens, very rarely more so. There is usually an analogy between their respective numbers in the same flower.

The two Orders of the 14th Class are distinguished by the nature of the Fruit.

1. GYMNOSPERMIA. Seeds naked, usually 4, never more. fig. 22.

2. ANGIOSPERMIA. Seeds in a Pericarp (61) mostly very numerous. fig. 175.

The two Orders of the 15th Class are distinguished by the shape of their Pericarp.

1. SILICULOSA. Fruit a *Silicula*, or Pouch (61:2). fig. 24.
2. SILIQUOSA. Fruit a *Siliqua*, or elongated Pod (61:2). fig. 30.

The various Orders of the 16th, 17th, and 18th Classes are characterized by the number of the Stamens, the Classes themselves being marked by their various modes of union. These Orders therefore bear the same appellations as the first 13 Classes.

The Orders of the 19th, or Compound-flowered, Class are marked by the Perfect, Separated, Barren, Fertile, or Abortive nature (65) of the Florets (68).

1. POLYGAMIA-ÆQUALIS. Florets all perfect, each having efficient Stamens and Pistil, and producing one Seed. fig. 57-63.
2. POLYGAMIA-SUPERFLUA. Florets of the disk perfect; those of the circumference, or radius, having a Pistil only: but both kinds forming perfect Seed. fig. 66-69.
3. POLYGAMIA-FRUSTRANEA. Florets of the disk perfect; those of the circumference with an abortive Pistil, or none at all. fig. 64, 65.
4. POLYGAMIA-NECESSARIA. Florets of the disk with Stamens only; those of the circumference with each a Pistil only.
5. POLYGAMIA-SEGREGATA. Several Flowers, either simple or compound, but with united An-

thers, and a Proper Calyx, all included in one Common Calyx.

The 6th Linnæan Order, *Monogamia*, consisting of Simple Flowers, with united Anthers, is abolished, as being unnatural, and extremely uncertain. fig. 195.

The Orders of the 20th Class are distinguished by the number of their Stamens. *Gynandria Monandria* fig. 70-72. *Tetrandria*, 73-76.

Those of the 21st and 22d by the same circumstance, or by any other character of the preceding Classes founded on the union of the Filaments.

The Orders of the 23d are,

1. MONOECIA. The two or three different descriptions of Flowers all on the same plant.
2. DIOECIA. The different descriptions of Flowers on two separate plants.
3. TRIOECIA. The same on three separate plants.

The Orders of the 24th Class are natural orders or families.

1. FILICES. Ferns. fig. 96-98. *Equisetum sylvaticum*. 99-101. *Aspidium Filix-mas*. 102-104. *Scolopendrium vulgare*.
2. MUSCI. Mosses. fig. 105-108. *Dicranum purpureum*. 109-113. *Hookeria lucens*.
3. HEPATICÆ. Liverworts. fig. 114, 115. *Jungermannia multifida*.
4. LICHENES. Lichens. fig. 116, 117. *Opegrapha scripta*. 118-120. *Lecanora murorum*. 121, 122. *Peltidea canina*.

5. ALGÆ. Flags. fig. 123-126. *Fucus natans*.

6. FUNGI. Mushrooms. fig. 129-133.

The 3d and 4th of these Orders are added since the time of Linnæus. The whole will be explained hereafter.

The difficulties, or exceptions, to which the above System is liable, are the following:—

Number in the parts of Fructification proves not always uniform in one Genus or Species, nor even in the same individual plant. In the latter case Linnæus teaches that the central, or terminal, Flower must be our guide, as in *Euonymus*, *Monotropa*, *Chrysosplenium*, and *Adoxa*. When a species is variable in the number of Stamens or Pistils, or if one or more species of any genus differ from the rest in those respects, such irregular species are to be named in a synoptical or analytical table at the head of the particular Class or Order to which they technically belong; though placed in due course, likewise, in the proper Class and Order of the Genus of which, independent of such artificial characters, they naturally form a part. The same plan is, of course, to be pursued with regard to any species, anomalous in other respects, as the dioecious ones of *Valeriana*, *Lychnis*, &c.

That this System sometimes puts widely asunder some genera naturally allied to each other (as a few with Ringent Flowers, that by their natural affinity belong to the 14th Class, placed in the 2d because

they have only two Stamens), is no objection to it on the score of facility or convenience. It does not profess to be a natural arrangement; and if in many parts it proves so, more is performed than had been promised, or than could reasonably be expected. The 15th and 19th Classes are perfectly natural (except *Cleome*, badly placed in the former); as are, more or less, several Orders, or Sections of Orders, in other Classes.

Greater technical inaccuracy occurs relative to some characters, founded on connexion of parts. The Stamens, or Filaments, of several Papilionaceous genera, referred with their strictly natural allies, to *Diadelphia Decandria*, are perfectly monadelphous fig. 40. We do not mean merely that their two sets of Stamens are united into one at the base; but there is really no distinction of two sets, in any part of their structure. Indeed if the ten Filaments are any way combined, in a Papilionaceous Flower, such is referred by Linnæus to the Class and Order just mentioned. If they are altogether distinct, in which case their whole configuration is totally dissimilar from the flat and membranous Filaments of the true *Diadelphia*, they belong, though Papilionaceous, to the 10th Class.

Culture, and other accidents, produce changes against which no principles of arrangement can provide. Such causes peculiarly affect *number* in the parts of a Flower, the Stamens, and Pistils, as well

as the divisions of the Calyx and Corolla, being frequently multiplied by luxuriance of soil, to the great delight of florists, but much to the inconvenience of botanists. So also the Stamens and Pistils are often transformed to Petals, which constitutes a double Flower.

In the Classes with separated Flowers, accidents occur with regard to the situation of the Stamens or Pistils. If the structure of the other parts of the Flower be alike, in every individual, both these organs are liable to meet in the same Flower; just as, on the other hand, they occasionally are met with separate, in Classes, or in some Species of Genera, to which united Flowers naturally belong (65). Hence so great a proportion of trees in hot climates, as well as of grasses in all climates, are polygamous; having the characters of the 23d Class, as defined by its author Linnæus. But if respect be always had to the accessory parts of a Flower (53, 54), as well as the essential ones (58, 59), and those are found different in structure, number, or otherwise, such Flowers must remain permanently distinct. Such only would I admit into the Class *Polygamia*, by which measure botanists in tropical countries are relieved from one of the greatest of inconveniences.

I have even ventured to suggest, *Introd. to Botany*, ed. 3. 368, that the 21st, 22d, and 23d Classes of the Linnæan system might possibly be well reduced to one, under the name of *Diclinia* (already used by

Jussieu and some other writers), which might contain all genera with separated Flowers, whose accessory organs differ in any respect. This alteration has been adopted by an able practical botanist, whose experience had taught him to approve it, Mr. Frederick Pursh in his *Flora Americae Septentrionalis*, published in 1814. He has divided the Class *Diclinia* into the three following Orders.

1. SEGREGATÆ. Flowers not Amentaceous (53:3)
2. AMENTACEÆ. Barren Flowers, at least, in Catkins (53:3); the Fertile ones not always so. Fruit distinct from the Calyx. fig. 274, 275.
3. CONIFERÆ. Barren and Fertile Flowers in Catkins. Fruit a *Strobilus* or Cone, (61:7) fig. 276

Under each Order of the Linnæan System, are disposed the Genera which belong to it, in a regular series, as nearly as possible according to their natural affinity to each other, with the Essential Characters (104) of each. The Species are, in like manner, ranged according to their affinities, under each Genus, with their Specific Characters. Synonyms are subjoined with mention of the native country of each Species after which follow occasionally compendious descriptions, with any useful remarks. Some large Genera are commodiously divided into Natural Sections, by leading characteristics of certain Species taken collectively.

At the head of every Class, all its Orders are enumerated; and under each Order its appropriate Ge-

nera are arranged, in a Synoptical or Analytical manner, according to their shortest, most technical, characters. In these, whatever part of the Fructification affords the most decisive or striking characters in each artificial Order or subdivision, takes the lead, the others following according to their importance. But in the above-mentioned Essential Characters (104), at the head of each Genus, the parts of Fructification, whence those characters are derived, should be disposed, as has already been observed, according to their relative importance in the particular Natural Order, or Series, to which such Genera belong.

These are the principles of arrangement which Linnæus appears to have laid down for himself, and upon which he gradually improved. But in the detail of his System he has not always kept them strictly in view; nor have his pupils, followers, or editors, paid the requisite attention to them, especially with regard to those intricate or recondite natural relationships, which few of these writers perhaps were competent to observe, and to which, it must be confessed, botanists of the old Linnæan school have generally paid too little attention.

Respecting Nomenclature, it is only necessary to remark, that every Genus should be distinguished by a name, either of Greek or Latin derivation, or formed out of the proper name of some botanist, worthy of such commemoration. Names of barbarous origin have, however, crept in, by the means of Linnæus

himself, contrary to his own wise laws. Genera have also been dedicated to abundance of persons, who have no claim to this honour. Corrupt names, composed of other generic appellations, already established, though strictly and judiciously prohibited by classical botanists, have here and there been introduced. Of these the worst of all are made up of two such established names as *Calamagrostis*. Future general writers on Botany, of competent authority, must reform these abuses. No authority can sanction their continuance. If any indulgence be admitted, it may perhaps be in favour of a few well-sounding generic names of barbarous origin; for there can be no question that Pliny, and even purer Latin writers, would have adopted such names, properly modified, had they treated of the new plants of foreign countries.

The generic name being fixed, each Species must also be designated by an appropriate concise appellation, of a single word if possible. This should be either a characteristic adjective, expressive of the character, aspect, colour, quality, or use of the Species, or of some substantive, not necessarily agreeing in gender with the generic name, and therefore always beginning with a capital letter, by which some circumstance in the history of the plant, or some synonymy may be recorded.

Important or permanent Varieties (74) may, with propriety, be noticed. These are conveniently marked

with the Greek letters, numbers being reserved for Genera and Species.

It would be well for every person who undertakes to write a systematic work on Botany to consider these leading principles of Linnæus, and to study with care those more particular ones, laid down in his *Fundamenta Botanica*, as well as his *Philosophia* and *Critica*. If his rules be faulty or unnecessary, they should be expunged; but no good writer will transgress them through ignorance or neglect.

His principles for the distinction of Species should be studied and contemplated over and over again, by every person ambitious of permanent botanical fame, beyond the reach of the fashions of System. This department of Botany Linnæus justly terms *artis robur*, the strength, or sinews of the science. Species are perhaps the only distinctions which are indubitably natural; and to stamp them clearly, as well as concisely, is the most important, perhaps the most difficult, office of the philosophical botanist. No one yet has equalled Linnæus; nor has any one swerved from his rules, in theory or in practice, but for the worse. No intended improvement in this department has come under my inspection, that does not appear to me worse than indifferent. I speak with the greatest respect and deference for the authors of such projects, which it would be invidious to particularize, and which have, doubtless, been well intended. The more common faults in these compositions arise from negligence

or inability, from a want of deep study of the subject, or a confusion or inaccuracy of ideas, a feebleness of style or expression, or a want of command of language.

I have chosen to conclude this chapter with the subject of specific characters, because it is of the most fundamental importance, and the most difficult in practice. It is the only sure ground of what Linnæus justly declares as the test of a good botanist, the knowledge of the greatest number of Species. (*Phil. Bot. sect. 256.*) Now this knowledge, if merely empirical, can be but of little value or certainty. Its dignity and solidity must consist in an intimate acquaintance with the comparative or respective importance of different characters, in different orders, tribes, or genera of plants. Several general rules indeed may be given, but scarcely one of those is without exception; and particular rules apply to almost every natural assemblage throughout the vegetable kingdom. The latter are only to be attained by acute observation and great experience.

The 8th chapter of the *Philosophia Botanica* of Linnæus, entitled *Differentiæ*, contains a full display of the ideas of that great writer, the first who ever undertook to consider this matter in a philosophical light, or to lay down any rules for the guidance of others. We shall give an epitome of his principles, recommending his reasons and illustrations, in the chapter just cited, to the attentive consideration of the student, who, before he attempts to apply them

practice, should give his days and nights to the subject.

A *Differentia Specifica*, Specific Character, or as Linnæus usually called it *Nomen Specificum*, should comprehend such characters only as are requisite, or sufficient, to distinguish a plant from every other species of the same Genus. Such therefore is not a *description*, but a *difference*, and where only one Species exists, a *Differentia Specifica* is an absurdity. If it attempts to contrast the plant with the Species of any other Genus, it is fallacious and erroneous.

A Specific Character therefore is the essential peculiarity of the full description, or complete idea, of every plant, whether drawn out in detail, or existing in the mind of the author.

All accidental circumstances are necessarily to be excluded, such as Country, Situation, Duration, Economical Uses, the Name of the Discoverer, &c.

All marks universally variable are also to be omitted, among which are Colour, Smell, Taste, Size, Hairiness in general, Curling of Leaves, Doubling of Flowers, or any kind of Monstrosity.

The direction of the hairs of Plants, as on the Calyx and Flowerstalk in *Mentha* and *Myosotis*, the Stem of *Papaver*, and some other instances, not noticed by Linnæus, forms one exception to the above rule; and perhaps the presence or absence of a glaucous hue in the herbage is another.

Characters which presuppose any knowledge of

other plants, even of the same Genus, in the reader as well as any allusions to the rarity or frequency of a plant, are manifestly faulty.

The Root (7) often affords solid specific distinction but is not infallible; nor can it always, in cultivated plants, or in dried specimens, be examined, or preserved.

Stems (12) frequently afford clear and certain distinctions, in their forms, postures, angles, wings, and other particulars.

Leaves (30) abound in the most elegant and unexceptionable characters for specific discrimination, in their situation, form, division, surface, margin, veins, and even pubescence. But scarcely any one mark concerning them is absolute, throughout all plants whatever, and experience only can teach, in every case, what is most to be relied on.

Appendages (47) are usually very serviceable for specific characters, especially the Stipulas, as to their presence or absence, situation, form, or even duration.

Inflorescence (48) is declared by Linnæus to yield the best of all specific differences. *Phil. Bot. sect. 27*. The importance of the distinctions to be derived from hence is so great, that some botanists, especially the French school, do not scruple to found some of their Generic Characters upon it. Even Linnæus was justly charged with having had recourse to the Inflorescence, in arranging the Genera of the Umbellifera tribe (48:7), though the principle is disguised under

the idea of an Aggregate Flower (69). Our great leader is the more censurable, as the Flowers and Seeds of those Plants, properly studied, afford all-sufficient Generic Characters.

The parts of Fructification themselves, so far as their differences do not enter into the Generic Characters, often display most excellent Specific marks. Such now and then serve to divide a genus into Sections; as the Petals in *Iris*, and the Styles in *Hypericum*.

The more concise a Specific Character, the better it is. As in philosophy, it is not allowed to recur to two causes for the explanation of any phænomenon, when one is sufficient, so if one idea will serve to distinguish a Species, no more should be admitted. If more be necessary, as is generally the case in large Genera, they should be so disposed and contrasted, in the several Specific definitions, as to strike the mind at once forcibly and distinctly. This cannot be done if characters be much extended. Linnæus has therefore limited each definition to twelve words. There is no magic in this number, but I believe it is seldom exceeded with any good effect. Much will depend, after all, on the wording and construction of the sentence. A weak character of half a dozen words may be puzzling and insufficient; while a much longer may be clear, and readily conceived as well as compared, at one view.

All the terms and definitions should be precise, lite-

ral, and unambiguous. They are not allowed to be expressed in the comparative degree, though sometimes admitted, of late, in the superlative. They must be positive, not negative; devoid of obscure comparisons; contain no adjective but what follows its substantive; no article, connecting particle, or parentheses.

Linnæus has adopted an arbitrary mode of punctuation in Specific Characters, in which the usual power of the different signs is reversed. He uses a Comma (,) to separate the different parts of the plant which come into the Specific Character. This is most frequently wanted, as between the Stem and Leaves and Inflorescence, if they all happen to occur. A Semicolon (;) separates two descriptions of the same organ, as Radical Leaves from the rest. A Colon (:) is introduced between the several parts or divisions of any one organ, as the segments, margin, or veins of a Leaf. A Period (.) of course, as usual, closes the sentence. The intention of this method seems to be to lead the mind to a longer pause, in proportion as the parts under consideration are most nearly related. To practise it quite correctly requires more attention than is usually bestowed; and even Linnæus, or his printer, makes frequent, though not very serious mistakes. The following examples are correct:—

Biscutella siliculis glabris, foliis lanceolatis serratis.
Dentaria foliis inferioribus pinnatis; summis simplicibus.

Cardamine foliis pinnatis: foliolis quinque incisis.



Smith, James Edward. 1821. "Exposition of the Linnæan artificial system, somewhat reformed." *A grammar of botany illustrative of artificial, as well as natural, classification, with an explanation of Jussieu's system* 40–59.

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